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10/619,703

12/08/2003

Tamer Kadous

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09/07/2004

Qualcomm Incorporated  
Patents Department  
5775 Morehouse Drive  
San Diego, CA 92121-1714

EXAMINER

NGUYEN, BRIAN D

ART UNIT

PAPER NUMBER

2661

DATE MAILED: 09/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/619,703

Applicant(s)

KADOUS ET AL.

Examiner

Brian D Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 December 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All   b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 19-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 19 recites the limitation "the plurality of transmit antennas" in line 7. There is insufficient antecedent basis for this limitation in the claim.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-5, 13-20, 22, and 25 are rejected under 35 U.S.C. 102(e) as being anticipated by Foschini et al (2002/0142723).

Regarding claim 1, Foschini discloses a method of processing symbols for transmission in a multi-carrier multiple-input multiple-output (MIMO) communication system, comprising:

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receiving at least one stream of symbols for transmission on a plurality of subbands and from a plurality of antennas (105-1, 105-2, ..., 105-4), multiplexing the at least one stream of symbols such that the symbols in each of the at least one stream are transmitted from the plurality of antennas and such that the at least one stream starts in the same subband; and forming a stream of multiplexed symbols for each of the plurality of antennas (see figure 8; page 7, right column, lines 14-22).

Regarding claim 2, Foschini discloses the symbols in each of the at least one stream are transmitted diagonally across the plurality of subbands and the plurality of antennas (see paragraph 0044).

Regarding claim 3, Foschini discloses NT streams of symbols are multiplexed to form NT streams of multiplexed symbols for NT antennas (see figure 8 where  $NT = 4$ ).

Regarding claim 4, Foschini discloses one stream of symbols is multiplexed to form NT streams of multiplexed symbols for NT antennas (see figure 8 where one stream of symbols is any one of the streams).

Regarding claim 5, Foschini discloses ND streams of symbols are multiplexed to form NT streams of multiplexed symbols for NT antennas (see figure 8 where  $ND = NT = 4$ ).

Regarding claim 13, Foschini discloses a codeword for a stream in the at least one stream wraps around the plurality of antennas.

Regarding claim 14, claim 14 is a method claim that has substantially all the limitations of claims 1 and 6. Therefore, it is subject to the same rejection.

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Regarding claims 15 and 16, claims 15 and 16 are apparatus claims that have substantially all the limitations of the respective method claims 1 and 6. Therefore, they are subject to the same rejection.

Regarding claims 17 and 18, claims 17 and 18 are apparatus claims that have substantially all the limitations of the respective method claims 1 and 6. Therefore, they are subject to the same rejection.

Regarding claim 19, claim 19 is a method claim that has substantially all the limitations of method claim 1 in which the process is in reverse. Therefore, it is subject to the same rejection.

Regarding claim 20, Foschini discloses performing equalization and recovering (see paragraphs 0005 and 0091).

Regarding claim 22, Foschini discloses the process includes performing equalization, recovering the detected stream, estimating interference, canceling the estimated interference, wherein the performing and recovering are repeated on the plurality of streams of modified symbols to recover a second stream (see paragraphs 0005, 0033-0036, 0091).

Regarding claim 25, claim 25 is an apparatus claim that has substantially all the limitations of the respective method claim 1 wherein the process is performed at the receiver. Therefore, it is subject to the same rejection.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 6-10, 21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foschini et al (2002/0142723).

Regarding claims 6-9, Foschini does not specifically disclose each antenna is transmitted at full power available for the antenna, each of the at least one stream is transmitted at NT/ND times full power for one antenna in the plurality of antennas, the same amount of transmit power is used for each of the at least one stream of symbols, or the same total power is used for the plurality of antennas for each of the plurality of subbands. However, to assign a transmitting power level for each of the antennas is a matter of choice. In addition, Foschini discloses that power levels can be selected (see paragraph 0017). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to select an appropriate power level for each of the antennas in order to meet specific needs.

Regarding claim 10, Foschini does not specifically disclose a variable number of streams of symbols is transmitted based on channel condition. However, it is well known in the art that increasing the transmitting power will improve the channel condition. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to vary the number of streams of symbols such as decreasing the number of streams of symbols so that more power can be located to main streams of symbols.

Regarding claims 21 and 23, Foschini does not specifically disclose the use of a successive interference cancellation or a coded interference estimation techniques. However, to use any well known techniques is a matter of choice. Therefore, it would have been obvious to a

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person of ordinary skill in the art at the time the invention was made to use appropriate techniques to cancel the interference in order to meet specific needs.

7. Claims 11-12 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foschini et al (2002/0142723) in view of Ko et al (6,744,813).

Regarding claims 11-12 and 24, Foschini discloses different rates but does not specifically disclose a rate is determined based on a received signal quality or on an order in which the at least one stream is recovered at a receiver. However, Ko discloses an rate adaptive system in which rate is determined based on error rate or noise (see col. 4, lines 11-25). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to adjust the rate in order to improve the quality of the communication.

### *Conclusion*

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Baum (2002/0085641), Wallace et al (6,473,467), Foschini (6,097,771), and Ma et al (2004/0062193).

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian D Nguyen whose telephone number is (571) 272-3084. The examiner can normally be reached on 7:30-6:00 Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doug Olms can be reached on (703) 305-4703. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



8/31/04

**BRIAN NGUYEN**  
**PRIMARY EXAMINER**